SCIENCE, AERONAUTICS AND TECHNOLOGY

FISCAL YEAR 2000 ESTIMATES

BUDGET SUMMARY

AERO-SPACE TECHNOLOGY

SUMMARY OF RESOURCES REQUIREMENTS

	FY 1999 OPLAN 12/23/99	FY 2000 OPLAN REVISED	FY 2001 PRES BUDGET	Page Number
		(Thousands of Dollars)		
Aero-space research and technology	1,198,548	984,849	1,058,000	SAT 4.1-1
Commercial Programs	140,352	140,005	135,000	SAT 4.2-2
Total	1,338,900	1,124,854	1,193,000	

AERO-SPACE RESEARCH AND TECHNOLOGY PROGRAMS

PROGRAM GOALS

NASA is responsible for addressing aeronautics and space priorities as outlined by the National Science and Technology Council in national aeronautics and space policies. The responsibility of industry and operational government agencies is to meet their near-term customer requirements through evolutionary advancements to their products. The Aero-Space Technology Enterprise's responsibility is to provide revolutionary advancements in science and technology that sustain global U.S. leadership in civil aeronautics and space. To meet this challenge, the Enterprise's objectives are grouped into three synergistic goal areas or "pillars": Global Civil Aviation, Revolutionary Technology Leaps and Access to Space. The objectives within these goals are framed in terms of final outcomes once NASA-developed technology is integrated with, and further developed by, its partners. The technologies associated with these goals and objectives are pre-competitive, long-term, high-risk research endeavors with high-payoff in terms of market growth, safety, low acquisition cost, consumer affordability and cleaner environment. The goals and objectives are ambitions and stretch the boundaries of our current knowledge and capabilities. Priorities are established and resources aligned to enable achievement of the high priority objectives on a timely basis.

Pillar One: Global Civil Aviation

Global civil aviation provides the backbone for global transportation, the very basis of global economic and cultural exchange and integration. It is a large and growing market that the U.S. has traditionally led. Projected growth approaches a tripling of air traffic over the next twenty years. Moreover, examination of various alternative futures suggests that there is also the potential for greater dispersion of operations, very high value for flexible, ultra-reliable operations, and increasing utilization of aircraft with unique operational characteristics.

A need exists to address the fundamental, systemic issues for the aviation system to ensure the continued growth and development appropriate to the needs of the national and global economies. These systemic issues—safety, capacity, environmental compatibility, and affordability cut across markets including large subsonic civil transports, air cargo, commuter and general aviation, and rotorcraft. To ensure these systemic issues do not become constraints, dramatic improvements should be aggressively pursued. Therefore, the Enterprise has worked with its partners to identify five enabling technology objectives to sustain the United States aeronautics leadership by providing high-risk technology that cuts across all markets in Global Civil Aviation:

- Reduce the aircraft accident rate by a factor of five by 2007 and by a factor of 10 by 2022.
- Reduce emissions of future aircraft by a factor of three by 2007, and by a factor of five by 2022.
- Reduce the perceived noise levels of future aircraft by a factor of two (10db) from today's subsonic aircraft by 2007, and by a factor of four (20bd) by 2022.
- While maintaining safety, double the aviation system throughput, in all weather conditions, by 2007.
- Reduce the cost of air travel by 25 percent by 2007 and by 50 percent by 2022.

Pillar Two: Revolutionary Technology Leaps

In addition to the systemic issues associated with the global civil aviation system, there is tremendous opportunity to explore high-risk technology to revitalize existing markets and open new markets. Examination of future trends and various alternatives highlighted the opportunities in high-speed civil transportation, general aviation and experimental aircraft. In addition to new market opportunities, there exist opportunities to revolutionize the way aircraft and space transportation systems are designed and developed. It is also critical to recognize that achieving the goals in all three pillars requires the rapid exploration and validation of concepts and technologies in the flight environment.

The Enterprise and its partners have identified three high-risk enabling technology objectives that can revolutionize air travel and the way in which aerospace vehicles are designed, built and operated:

- Reduce the travel time to the Far East and Europe by 50 percent by 2022, and do so at today's subsonic ticket prices.
- Invigorate the general aviation industry, delivering 10,000 aircraft annually by 2007 and 20,000 aircraft annually by 2022.
- Provide next-generation design tools and experimental aircraft to increase design confidence, and cut the development cycle time in half for aircraft and space transportation vehicles by 2007 and by 75% by 2022

Pillar Three: Access to Space

NASA's primary space launch role is to develop and demonstrate pre-competitive next-generation technology that will enable the commercial launch industry to provide truly affordable and reliable access to space. NASA and the U.S. aerospace companies have embarked on an unprecedented partnership aimed at attaining revolutionary improvements in launch system cost, performance, and reliability. In response to National Space Policy and the NASA Strategic Plan, two enabling technology objectives have been identified to dramatically increase the contribution to the National goals in space:

STRATEGY FOR ACHIEVING GOALS

When the Enterprise identified the three pillars and ten enabling technology objectives, it was recognized that they are highly ambitious and will stretch the boundaries of the U.S. knowledge and capabilities. In order to achieve these National objectives, NASA carries out its aero-space technology mission in close partnership with U.S. industry, academia and other Federal agencies, such as the Department of Defense (DoD) and the Federal Aviation Administration (FAA). During FY 1998, the Enterprise developed detailed roadmaps to define the path that it would need to follow in order to allow this partnership to achieve these objectives. The Enterprise budget has been realigned to concentrate resources on the timely accomplishment of several high-priority objectives (i.e., aviation safety, emissions reduction, capacity, next generation design tools and experimental aircraft, and access to space) that directly impact the general public, have potential for true leapfrog advancements or support NASA's space mission. Progress toward other objectives continue through fundamental research.

As part of the FY 2001 budget development, the Aeronautical and Space Research and Technology Base programs have been integrated into a unified Aero-Space Research and Technology Base program and three new focused research programs have been added. As a result of these changes, the Enterprise will be able to accelerate its efforts to achieve its access to space goals and continue active programs associated with noise reduction and the invigoration of the General Aviation industry. Each of these items are discussed below.

Small Air Transport System (SATS). The objective of SATS is to develop and demonstrate technologies for small aircraft that will enable safe, efficient use of these aircraft at small, public use airports. Community vitality and economic opportunity are dependent on access to the high speed transportation afforded by small aircraft. Building on NASA's success in developing general aviation technologies, most notably the Advanced General Aviation Transport Experiments (AGATE) project, SATS addresses the technical barriers that have impeded growth in this area: safety of flight and accessibility to underutilized public use facilities. SATS will develop the vehicle and the infrastructure technologies to improve safety by reducing the accident rate of small aircraft

to that of commercial transports, utilize the nation's under-used airspace and landing facilities at non-hub airports in all weather conditions, and increase capacity for efficient operations of commuter, regional and runway independent aircraft at hub airports.

Quiet Aircraft Technology. This program will build upon the highly successful efforts resulting from the NASA/FAA Noise Reduction program. The Quiet Aircraft Technology program is a direct result of the National Science and Technology Council *National Research and Development Plan for Aviation Safety, Security, Efficiency, and Environmental Compatibility*, November 1999 and the NASA/FAA vision for a noise-constraint-free air transportation system that would contain the 65 decibel contour within airport boundaries, a 10 decibel reduction from 1997 state of the art. It will develop technologies for engine and airframe source noise reduction and advanced operations to reduce community impact.

2nd Generation Reusable Launch Vehicle (RLV). Low-cost space transportation remains the key enabler of a more aggressive civil space program. A central tenant of the National Space Policy is the transition of routine space activities to the private sector to concentrate NASA resources on high-leverage science research, technology development, and exploration activities. By 2005, NASA will conduct competitive launch services procurement to support the launch requirements of both human and robotic spaceflight operations. The objective will be to dramatically improve safety while significantly reducing the cost of such launch services, thus eliminating the current need for the Government to own and operate the full system.

The President's 2001 Budget supports new funding for a 2nd Generation RLV to enable this competition. The key element of the 2nd Generation RLV is a 2nd Generation RLV program that will substantially reduce the technical, programmatic and business risks associated with developing a safe, reliable and affordable 2nd Generation RLV architecture. The program will invest in technology development, business planning, design and advanced development efforts to enable at least two competitive options for a new architecture. Identification and development of systems to meet NASA's unique space transportation needs on commercial vehicles and the near-term pursuit of alternative access for key Space Station needs are also both critical elements of this effort. The program will be implemented to assure that the full-scale development of any new systems can be initiated no later than 2005.

Commercial Technology Programs

Since its inception in 1958, NASA has been charged with ensuring that NASA-developed technology is transferred to the U.S. industrial community to improve the competitive position of the U.S. in the world community. The scope of the commercialization effort encompasses all NASA technologies created at NASA centers by civil servants, as well as innovations from NASA contractors. The technology commercialization program consists of: (1) a continuous inventory of newly developed NASA technologies; (2) an up-to-date searchable database of this inventory; (3) assessments of the commercial value of each technology; (4) dissemination of knowledge of these NASA technology opportunities to the private sector; and (5) support of an efficient system for licensing NASA technologies to private companies. In addition, NASA commercialization efforts also include the operation of the Small Business Innovation Research program, which is designed to enhance NASA's use of small business technology innovators and lead to increased commercialization of NASA technology with small firms.